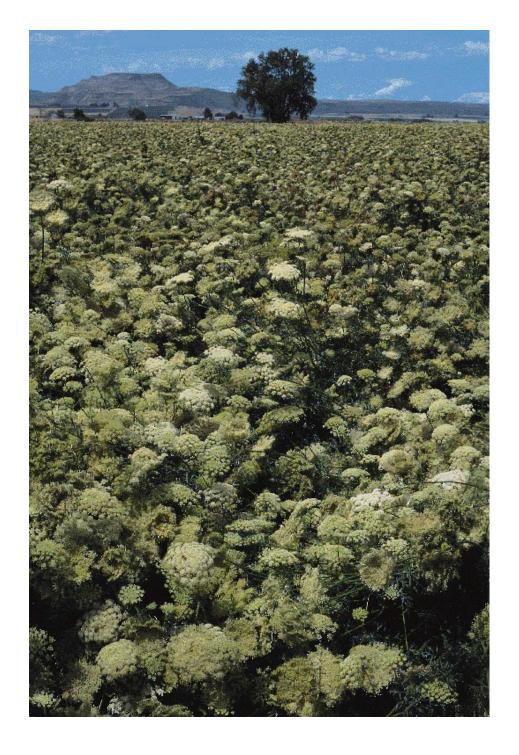
How Much Water Do Seed Carrots Need?



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J. Steiner, "established for the first time the amount of water that carrot plants

need to produce their best yields of clean, live seed.

runchy and colorful,
carrots are America's
sixth most popular
vegetable. We each eat
about 11 pounds of
carrots a year—a low-calorie source
of fiber, potassium, and betacarotene, the nutrient that our bodies
use to form vitamin A.

It took 400,000 pounds of seed, worth about \$16 million to producers, to grow 1995's 3.8-billion-pound carrot crop valued at \$448 million.

The way that some of the largest seed companies in this country currently water their seed carrots has been influenced, in part, by an ARS study that was first reported about 5 years ago.

"Our experiments," says agronomist and study team member Jeffrey J. Steiner, "established for the first time the amount of water that carrot plants need to produce their best yields of clean, live seed. Our reports apparently motivated people to start taking a new look at their then-conventional practices and to experiment with some changes of their own."

Steiner said the 3-year study revealed important differences in the water requirements of the two leading types of commercially grown carrots, Nantes and Imperator.

Seeds for the cylindrical Nantestype carrots are sold mostly for

A carrot seed crop in bloom near Nyssa, Oregon. (K7297-1) Photo by Michael Thompson growers overseas. American farmers and consumers favor the tapered Imperator carrots.

When Nantes and Imperator are grown for seed in a hot, dry climate like the research team's central California study site, they need about 22 to 25 inches of water from the time they are planted until seed from the almost-white, umbrella-shaped king umbel—the uppermost flower cluster atop the seed stalk—and lesser umbels beneath it matures.

In general, Nantes carrots produce *larger* amounts of clean, live seed when moderately water-stressed; that is, when they receive only about 80 percent of the irrigation water that they require.

That's not the case for Imperator carrot plants, however. Imperators may bear *smaller* quantities of viable seed if they receive, for example, only 60 to 80 percent of the water that they need, instead of 100 percent of their estimated requirement.

If given too much water, such as 120 percent of their needs, Nantes carrots will likely yield fewer live seeds, the scientists say. But extra water apparently doesn't dampen Imperator production of healthy seed.

These findings, from scrutiny of some 2,000 seed carrot plants grown in a research field near the Fresno laboratory, apply not only to key seed-producing regions of California, Oregon, Washington, and Idaho, but also to many other sites where seed carrots are grown.

That's because the levels of water stress that the researchers recommend

for boosting production of healthy seed should hold true for a range of soil types and climates.

To gauge water stress, growers can sample a few of carrots' fernlike leaves with a standard, tabletop instrument known as a pressure bomb. They can compare these field readings to the scientists' recommendations, then irrigate accordingly—either adding or withholding water to meet or maintain the prescribed levels.

The study was the work of Robert B. Hutmacher, plant physiologist with the ARS Water Management Research Laboratory, and Steiner, formerly on the faculty at California State University, Fresno, and now at the ARS National Forage Seed Production Research Center at Corvallis, Oregon.

The two collaborated with agricultural engineer James E. Ayars and biological lab technician Susan S. Vail, both of the ARS Fresno laboratory; and Alvin B. Mantel of Israel's Volcani Center, who at the time of the experiment was a visiting scientist at Fresno.—By Marcia Wood, ARS.

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